

Research Methodology in Computer Science

Solving Problems

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How about you?

- Research Fields:
- More Specific:
- What did most researchers do?
 - ▶ Problem1
 - ▶ Problem2
 - ▶ Problem3
- What did you think?
 - ▶ Problems
 - ▶ Methods
 - ▶ Algorithms

Homework #3 (10%)

Please prepare a 15 minute presentation to introduce the research problems you find in this semester. We will determine the presentation order in the next week.

Presentation Order

- 12/30(3):
- 01/06(3):
- 01/13(3):
- 01/19(1):

Random Order Generator

Solving The Problems

Research Problems

Finding research problem is very important. However, you have to solve it in order to complete your thesis.

- Mathematical Problems
 - ▶ Optimization problem
 - ▶ Analytical Model
- Engineering Problem
- Empirical Research
 - ▶ From Observation
 - ▶ From Collected Data

Optimization Problems

- Step. 1 Define the problem precisely in mathematical form or via description
- Step. 2 Prove the complexity of the problem (NP-completeness or NP-hardness)
 - If YES, this is a great contribution
 - If NO, you cannot convince the readers that there is no polynomial time algorithm to solve the problem
- Step. 3 Propose an algorithm or heuristic to solve the problem
- Step. 4 Prove the effectiveness in mathematical method or via simulation
 - In mathematical method: great contribution
 - Via simulation: tell the readers the results only

Analytical Model

- Step. 1 Use Queueing Theory to emulate a real/simplified system
- Step. 2 Draw a Markov Chain to describe the system
- Step. 3 Propose a analytical algorithm
- Step. 4 Write a simulation problem
- Step. 5 Compare the results from algorithm and problem

Engineering Problem

- Step. 1 Define the problem and define the comparison criteria
- Step. 2 Propose an algorithm to solve the problem
- Step. 3 Write the program
- Step. 4 Show the results

Empirical Research

- Step. 1 Describe the problem
- Step. 2 Describe the sources of the data (observation or collected)
- Step. 3 Any observation results from the data using Statistics or Machine Learning algorithm
- Step. 4 Explain the results